

Find "a", "r", and "t<sub>n</sub>" for the following sequence!

$$t_n = ar^{n-1}$$

$$t_3 = 64, t_7 = 4$$

$$t_3 = ar^2 \quad t_7 = ar^6$$

$$ar^2 = 64 \quad ar^6 = 4$$

$$\frac{ar^6 = 4}{ar^2 = 64}$$

$$r^4 = \frac{1}{16}$$

$$r = +\frac{1}{2}$$

$$ar^2 = 64$$

$$a\left(\frac{1}{2}\right)^2 = 64$$

$$\frac{a}{4} = 64$$

$$a = 256$$

$$t_n = ar^{n-1}$$

$$t_n = (256)\left(\frac{1}{2}\right)^{n-1}$$

$$t_n = (2^8)(2^{-1})^{n-1}$$

$$t_n = (2^8)(2^{-n+1})$$

$$t_n = 2^{9-n}$$

# Arithmetic Series

Series: The sum of the terms of a sequence. The sum is usually finite:  $1+2+3+4+5$ . However it could be infinite:  $2+4+8+16+\dots$ . You can find the sum of many finite series and certain types of infinite series by using formulas.

$$S_n = \frac{n}{2}(2a + (n - 1)d)$$

$$S_n = \frac{n}{2}(a + t_n)$$

Find the sum of the first 100 terms of the arithmetic series  $1+4+7+10+\dots$

$$a = \underline{1}$$

$$d = t_2 - t_1 = \underline{3}$$

$$n = \underline{\underline{100}}$$

$$S_n = \frac{n}{2}(2a + (n-1)d)$$

$$S_{100} = \frac{100}{2}(2(1) + (100-1)(3))$$

$$= 50(2 + 99(3))$$

$$= 50(299)$$

$$= \boxed{14950}$$

Find the sum of the following series

$$\frac{1}{2} + 1 + \frac{3}{2} + 2, \dots + 20$$

Hint: How many terms are there?

$$a = \frac{1}{2}$$

$$d = \frac{1}{2}$$

$$t_n = 20$$

$$n = 40$$

$$t_n = a + (n-1)d$$

$$20 = \frac{1}{2} + (n-1)\left(\frac{1}{2}\right)$$

$$20 = \cancel{\frac{1}{2}} + \frac{1n}{2} - \cancel{\frac{1}{2}}$$

$$20 = \frac{n}{2}$$

$$n = 40$$

$$S_{40} = \frac{40}{2} \left( \frac{1}{2} + 20 \right)$$

$$= 20 \left( \frac{41}{2} \right)$$

$$= 410$$

$$\begin{aligned} & * \frac{1}{2} + \frac{20}{1} \\ & \frac{1}{2} + \frac{40}{2} \\ & \frac{41}{2} \end{aligned}$$

How many terms are in the series:  
 $3+8+13+\dots+248$  if its sum is 6275?

$$a = 3 \quad n = ?$$

$$d = 5$$

$$S_n = 6275$$

$$t_n = 248$$

$$S_n = \frac{n}{2}(a + t_n)$$

$$6275 = \frac{n}{2}(3 + 248)$$

$$6275 = \frac{n}{2}(251)$$

$$6275 = \frac{251n}{2}$$

$$251n = 12550$$

$$\boxed{n = 50}$$

Find the indicated sums of the following series:

$S_{15}$  of  $2+6+10\dots$

$$a=2$$

$$d=4$$

$$n=15$$

$$S_{15} = \frac{15}{2} (2(2) + (15-1)(4))$$

$$= \frac{15}{2} (4 + 14(4))$$

$$= \frac{15}{2} (4 + 56)$$

$$= \frac{15}{2} (60)$$

$$= \boxed{450}$$

$S_{20}$  of  $-15-10-5+\dots$

$$a=-15$$

$$d=5$$

$$n=20$$

$$S_{20} = \frac{20}{2} (2(-15) + (20-1)(5))$$

$$= 10 (-30 + 19(5))$$

$$= 10 (-30 + 95)$$

$$= 10 (65)$$

$$= \boxed{650}$$

# Homework

#1-8

